Table 1

Critical Ownership Shares

$$\eta / \eta_m$$

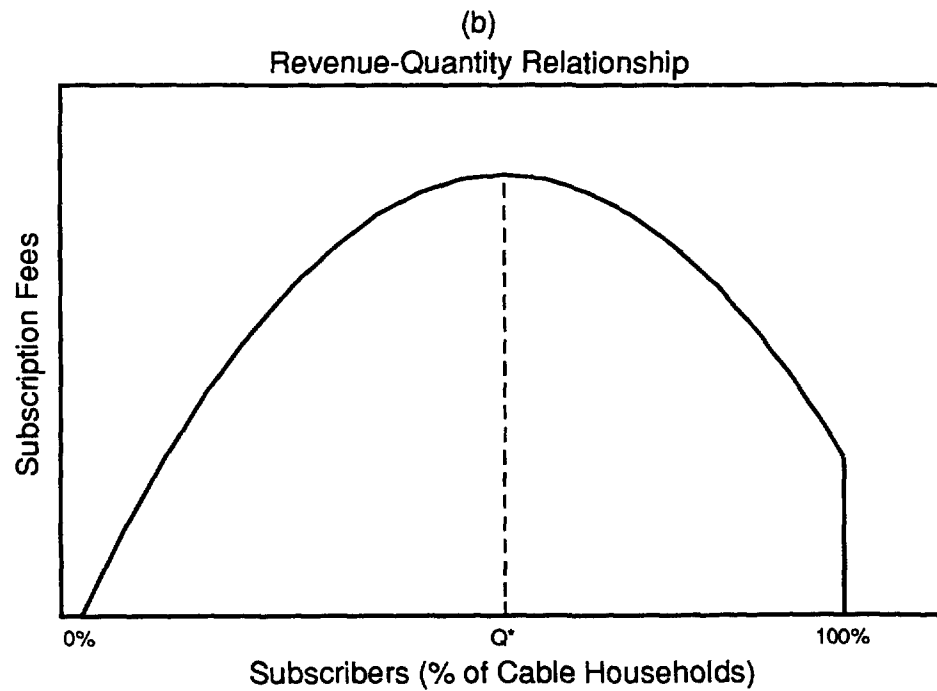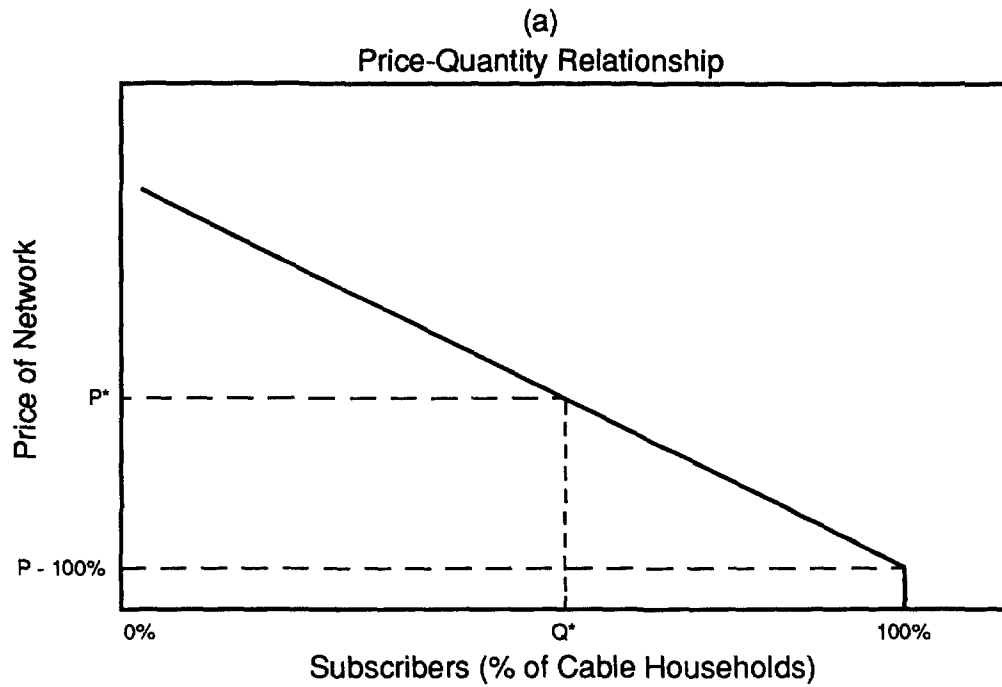|		1.0	0.75	0.5
	-1.2	0.96	0.70	0.46
η_m	-1.5	0.89	0.65	0.42
	-2.0	0.77	0.56	0.36

Entries in table are critical ownership shares below which a cable operator prefers a lower network price. η_m is the elasticity at the joint profit-maximizing price and η is the elasticity at the regulated price. The table is based on the assumption that the regulated price is 83% of the joint profit-maximizing price and that the price of the network is 5% of the joint profit-maximizing price.

Table 2
Critical Ownership Shares with 7.5% Mark-up

$$\eta / \eta_m$$

	1.0	0.75	0.5
-1.2	0.95	0.68	0.42
-1.5	0.88	0.62	0.38
-2.0	0.75	0.52	0.31

η_m

Entries in table are critical ownership shares below which a cable operator prefers a lower network price. η_m is the elasticity at the joint profit-maximizing price and η is the elasticity at the regulated price. The table is based on the assumption that the regulated price is 83% of the joint profit-maximizing price and that the price of the network is 5% of the joint profit-maximizing price.

Figure 1
DEMAND FOR A CABLE NETWORK

(a)
Price-Quantity Relationship

Price of Network

P*

P - 100%

0%   Q*   100%

Subscribers (% of Cable Households)

(b)
Revenue-Quantity Relationship

Subscription Fees

0%   Q*   100%

Subscribers (% of Cable Households)

Advertising Revenue

Figure 2

Advertising Revenue

Subscribers (% of Cable Households)

0%

100%

Figure 3
PRICE-REVENUE RELATIONSHIPS
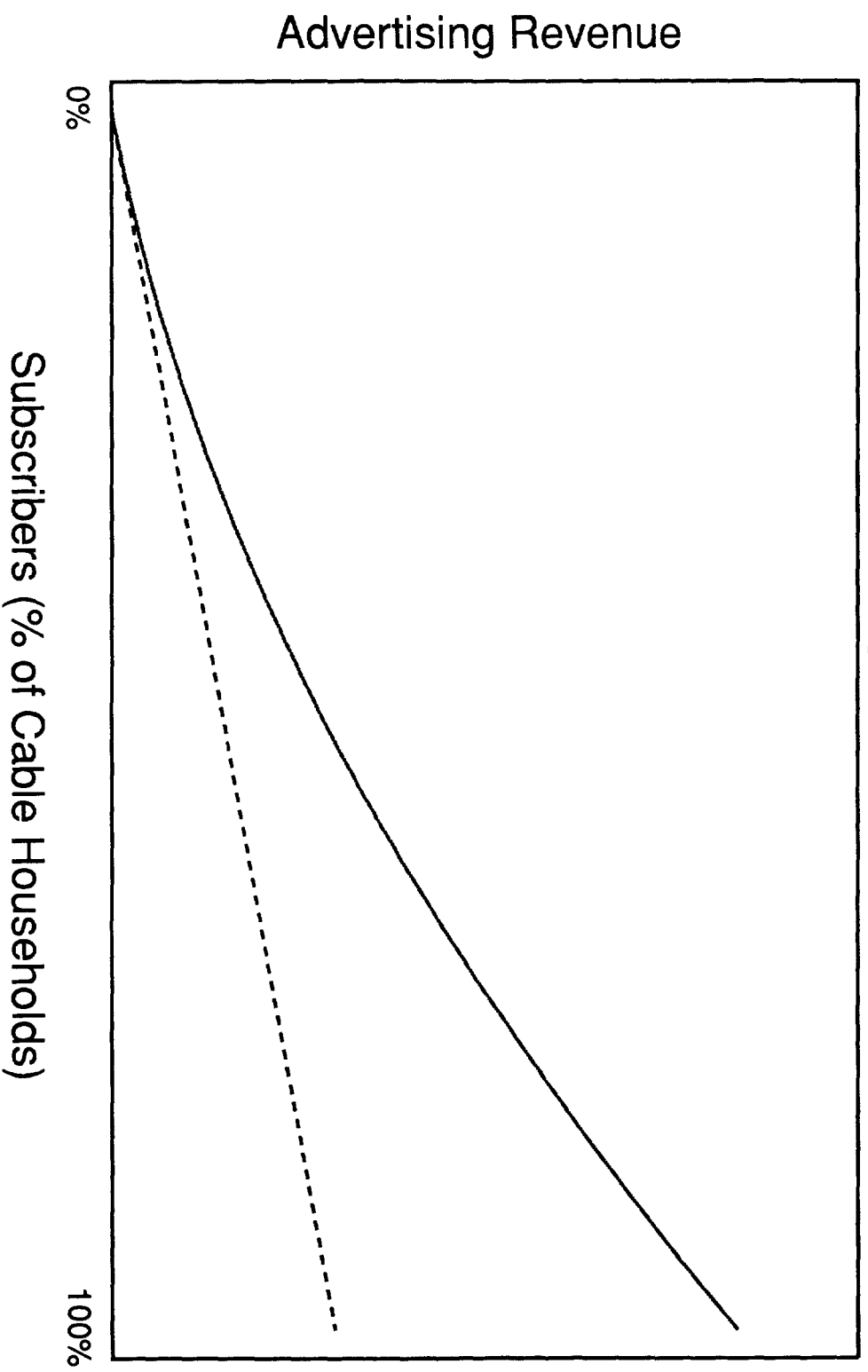
(a)
Total Revenue

(b)
Subscription Revenue

(c)
Advertising Revenue
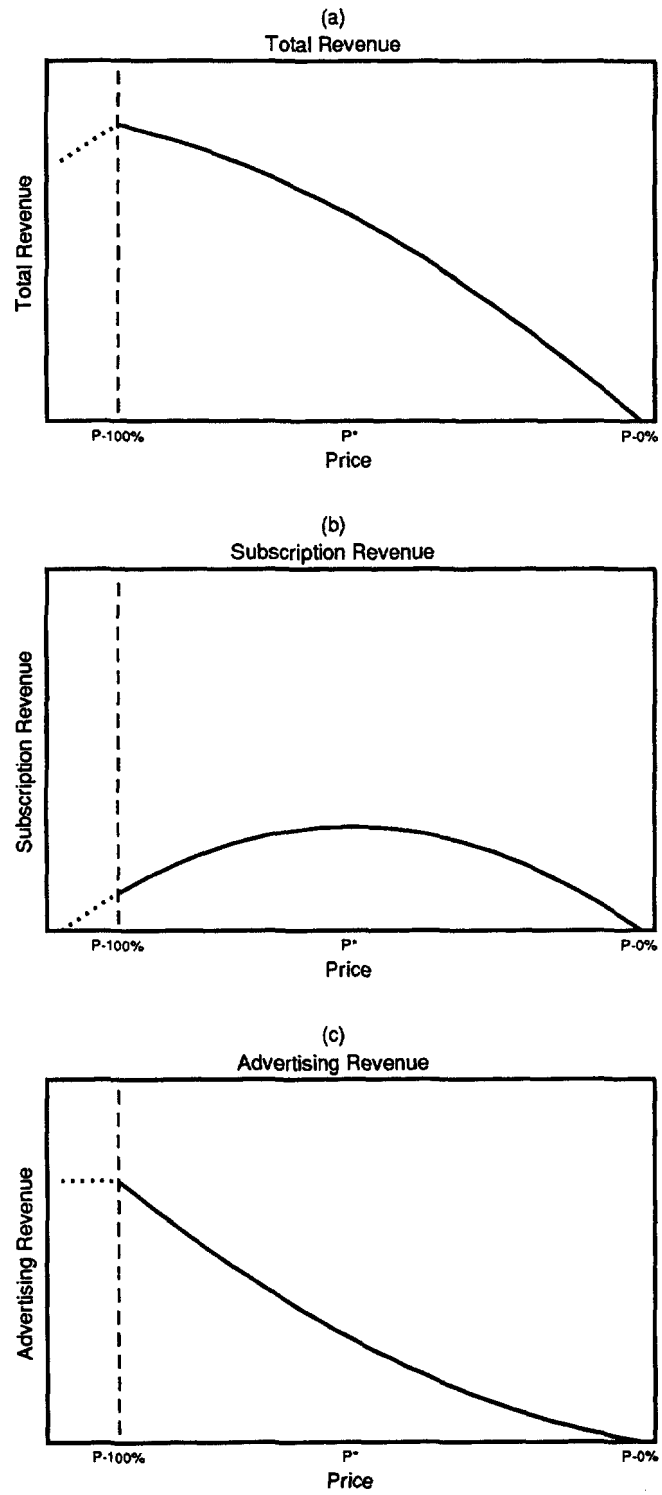
The Likely Effect of the FCC's Proposed Rule
for Affiliate Transactions Under Price Regulation

Michael A. Salinger
June, 1994

I

Introduction

In its Notice of Proposed Rulemaking "In the Matter of Implementation of Sections of the Cable Television Consumer Protection and Competition Act of 1992: Rate Regulation" (MM Docket No. 93-215) and "Adoption of a Uniform Accounting System for Provision of Regulated Cable Service," (CS Docket No. 94-28), the FCC has proposed a set of rules governing the effect of subscriber fees charged by cable networks to "affiliated" cable systems on the maximum price a cable system can charge its customers. Under the proposal, a "prevailing price rule" would govern affiliate transactions when less than 25% of a network's sales are to affiliates. When more than 25% of a network's sales are to affiliates, then the affiliate transactions are treated as occurring at the lesser of cost and fair market value. This paper analyzes the likely effect of these rules.

The remainder of the paper is organized as follows. Section II explains why the proposed regulations impose a cost on cable operators of investing in cable networks. Section III assesses how big the cost is likely to be and shows that it may be large. Section IV discusses the literature on vertical integration both in general and specifically in the cable television industry and assesses whether it justifies imposing a cost on investment by cable operators into networks. Section V discusses the likely problems in administering a "lesser of cost and fair market value standard." Based on the analysis in Sections II to IV as well as that in a companion paper,[1] Section VI concludes by arguing that the FCC should adopt a prevailing

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[1] Salinger, Michael A., "The Effect of a 'Prevailing Price' Rule for Affiliate Transactions under Price Regulation," June, 1994.

price rule under a much broader set of circumstances than those embodied in the proposed regulations.

II

The Nature of the Cost of a "Lesser of Fair Market Value and Cost" Rule

Under the proposed rule, the price that a cable operator can charge will depend on whether it has ownership stakes in the networks it carries. Because "fair market value" would presumably never be above the price charged to unaffiliated systems and because the allowed cost of a network for affiliates is the lesser of cost and fair market value, affiliates of a network will be able to charge less than they would if they were not affiliated. This effect on the price is a cost of affiliation to cable operators. If that cost is sufficiently large, cable operators can be expected to divest themselves of their ownership interests in cable networks.

To understand the nature of the cost and what determines how big it is, consider a cable operator that has 1 million subscribers when it charges $15. In addition to any fixed costs, it has a (constant) marginal cost of $5 per subscriber. Suppose the cable operator can charge $15 if it does not have any ownership share in a cable network that it carries. If it owns more than 5% of the network and the network sells less than 75% of its output to non-affiliates, suppose it is only allowed to charge $14.90.

One might suspect that the monthly cost to the cable operator of this restriction is $0.10 per subscriber, or $100,000. The cost may well be large, but it would be less than $100,000 per month. The price reduction induces some increase in demand. Suppose demand increases to 1,001,000. The additional 1,000 customers each generate a margin of $9.90. Thus, the loss

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to the cable operator is $100,000 - $9.90 · 1,000 = $90,100.

The magnitude of this loss obviously depends on a number of factors. First, it depends on the difference in the price that a firm can charge with an ownership stake in the network and without it. If the difference is $.05 per subscriber instead of $.10, then the cost would be smaller.

The effect of the price reduction on the quantity demanded also affects the cost. If the $.10 price reduction caused demand to increase by 5,000 instead of 1,000, then the monthly cost would be $100,000 - $9.90 · 5,000 = $50,500.

Finally, the size of the margin matters. Return to the original assumption that affiliation reduces the price by $.10, which in turn increases demand to 1,001,000. If the marginal cost per subscriber were $1.00 instead of $5.00, then the margin would be $13.90 (with the price reduction). Taking the increase in demand into account, therefore, the cost of the price reduction would be $100,000 - $13.90 · 1,000 = $86,100, which is less than the $90,100 monthly cost with the lower margin.

III

The Size of the Cost

This section presents estimates of the cost to TCI, Time Warner, Continental Cablevision, and Comcast of their affiliation with Turner Broadcasting under the proposed rules.[2] This cost can be decomposed into three components. The first is the difference between

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[2] Continental Cablevision and Comcast own less than 5% of the equity in Turner Broadcasting. Because each has a seat on the Board of Directors, however, they might be

the price that can be charged to cable customers with and without affiliation. The second is the number of subscribers. The third is what I will refer to as the "cost ratio." As was described in the previous section, a $1.00 reduction in the allowed price does not impose a cost per subscriber of a full $1.00. The cost ratio is the ratio of the cost (divided by the number of subscribers) to the price reduction.

i. The Cost Ratio

Let A be the cost to a cable operator of having to reduce its price by $1.00, divided by the number of subscribers. The appendix shows that:[3]

$$A = 1 + \frac{P - c}{P} \eta \tag{1}$$

where P is the price a non-affiliated cable operator can charge, c is the marginal cost to a cable system of having an additional subscriber, and η is the elasticity of demand[4] at the price the unaffiliated cable operator is allowed to charge. The right hand side of (1) consists of two terms. The "1" is the direct cost of a price reduction. The second term is what might be termed the "indirect benefit," which is the margin on the increased number of sales. Provided that the regulated price is below the monopoly price, the second term will be between 0 and -1. As a result, A is between 0 and 1.

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treated as affiliates.

   [3] Since A is stated on a per subscriber basis, equation (1) is derived by dividing equation (A3) by the number of subscribers (Q).

   [4] The elasticity of demand is the ratio of the percentage change in demand (the number of subscribers) divided by the percentage change in price. Because an increase in price causes a decrease in demand, the elasticity of demand is negative.

The appendix also shows that (1) can be rewritten as:[5]

$$A = 1 - \eta \frac{(1 - R) + \dfrac{1}{\eta_m}}{R} \tag{2}$$

where η_m is the elasticity of demand at the monopoly price and R is the ratio of the regulated price to the monopoly price.

The benchmark price caps impose a 17% price reduction. Under the benchmark, therefore, R = 1 - 0.17 = 0.83. Cable operators can, however, elect cost of service regulation; and they would presumably do so when they expect it to result in a higher price. Thus, we might also consider R = 0.90 and R = 0.95.

I know of two recent published estimates of the elasticity of demand for cable television service. Using 1982 data, Mayo and Otsuka[6] obtain a range of estimates from -0.70 for systems outside ADI markets[7] to -1.51 for systems in the top 50 ADI markets with an average of -0.97. Using a data base that included only cable systems in large cities, Rubinovitz[8] estimated a demand elasticity of -1.46. At the monopoly price, the elasticity must be greater

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[5] Equation (2) is derived by dividing equation (A6) by Q.

[6] Mayo, John and Yasuji Otsuka, "Demand, Pricing, and Regulation: Evidence from the Cable TV Industry," *The Rand Journal of Economics*, vol. 22, Autumn, 1991, pp. 396-410.

[7] ADI stands for "Area of Dominant Influence."

[8] Rubinovitz, Robert N., "Market Power and Price Increases for Basic Cable Service Since Deregulation," *The Rand Journal of Economics*, Volume 24, Spring, 1993, pp. 1-18.

than 1 in absolute value.[9] In this paper, I consider demand elasticities of -1.2, -1.5, and -2, with the last being implausibly high.

If the shape of the demand curve is such that the elasticity is constant, then the elasticities at the regulated price and at the monopoly price are equal. It is plausible, however, that demand would be less elastic at lower prices. Thus, for R = .83, I also consider the possibilities that η is $.75\eta_m$ and that it is $.5\eta_m$. Even with $R = .83$, this latter assumption is probably extreme. With R closer to 1, it is more implausible. For $R = .9$, therefore, I consider $\eta = .9 \, \eta_m$ and $\eta = .8 \, \eta_m$. For $R = .95$, I consider $\eta = .95 \, \eta_m$ and $\eta = .9 \, \eta_m$.

The results are reported in Table 1, which is divided into three parts. In panel (a), $R = .83$; in panel (b), $R = .9$; and in panel (c), $R = .95$. The range of estimates in Table 1 is broad. Depending on the underlying parameters, a $1.00 per subscriber price reduction could only cost a cable operator $0.011 (times the number of subscribers) or it could cost as much as $0.602 (times the number of subscribers). This latter figure rests, however, on an implausibly high value for the demand elasticity. Based on Table 1, therefore, we will take .022 as a low estimate of A, .327 as a high estimate, and .120 as a middle estimate.

ii. Price Reduction

The biggest source of uncertainty about how costly the proposed regulations will be is

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[9] Since the Mayo and Otsuka study used data from a period when cable television prices were regulated, the elasticities did not have to be greater than 1 in absolute value. (Even at unregulated prices, a monopolist might choose to price in the inelastic region of the demand curve for basic service to increase demand for pay services. Taking account of pay services would complicate this analysis considerably and would be unlikely to alter the qualitative conclusions.)

how much of a price reduction they will impose. The extreme case would be that cable operators elect cost of service regulation and the lesser of cost and fair market value is estimated to be 0. In that case, the price reduction would be equal to the subscriber fee. The reduction will be smaller if the lesser of cost and fair market value is estimated to be more than 0. For established networks, it would be less for cable operators electing benchmark regulation.

Section V discusses the difficulty in implementing the lesser of cost and fair market value standard. The estimates reported below will be based on the assumption that the regulations will reduce the allowed price by 50% of the subscription fee. This choice is not a forecast. For those who think a different percentage is appropriate, the estimates reported below can simply be rescaled by the appropriate constant.

The price was estimated by dividing expected 1994 subscriber revenues by the total number of subscribers (and dividing that by 12 to get the price on a monthly basis).[10] These percentage reductions were then multiplied by the subscriber fee, which was estimated as the total subscription fees divided by the number of subscribers.

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[10] Total subscriber fees is 1994 estimated subscriber fees from Paul Kagan Associates, *Cable TV Programming*, No. 193, May 23, 1994. According to Turner Broadcasting, its subscriber counts in May, 1994 were 55.7 million for CNN, 54.0 million for TNT, and 8.25 million for the Cartoon Network. No account was taken of quantity discounts. Taking them into account would reduce the estimated cost to TCI and Time-Warner, which are the two biggest MSO's.

iii. Number of Subscribers

The total number of subscribers to each MSO was taken from the *1993 Television and Cable Factbook.*[11] It was assumed that all subscribers receive CNN and TNT. Each MSO's subscriber count for the Cartoon Network was estimated as the MSO's total subscriber count multiplied by the ratio of total affiliated subscribers to the Cartoon Network to total affiliated subscribers to CNN.[12]

iv. Results

The results are reported in Table 2. Because of the wide range of estimates in the cost ratio, there is a wide range of estimates of the cost. With a cost ratio of .022, the cost to TCI of its affiliation with Turner Broadcasting under the proposed rules is roughly $1 million per year. For a cost ratio of .327, it is nearly $14 million per year. The estimates of the combined cost to the four affiliates ranges from $2.2 million for a cost ratio of .022 to $32.3 million for a cost ratio of .327.

Because these estimates are based on a specific assumption about the effect of affiliation on the allowed price of basic service under the proposed rules, the plausible range is still wider.

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[11] The subscriber counts are too low for two reasons. First, they are old. Second, they represent only the wholly owned systems of each MSO. TCI, in particular, has partial ownership shares in a large number of systems. Publicly available data on MSO subscribers were used because Turner Broadcasting is not allowed to release subscriber counts by MSO.

[12] Affiliated subscribers are those from TCI, Time Warner, Continental Cablevision, and Comcast. The total number of affiliated subscribers to CNN as of May 1, 1994, was 25.6 million. The total number of affiliated subscribers to the Cartoon Network was 3.53 million. Turner Broadcasting provided me with these data.

If it turns out that the lesser of cost and fair market value is estimated to be close to the prevailing price, then the cost will obviously not be great. On the other hand, the possibility that the lesser of cost and fair market value will be estimated to be 0 cannot be ruled out. Under that scenario, the cost will be substantial. Moreover, until the estimation of the lesser of cost and fair market value is resolved, the possibility of such a large cost is likely to have a chilling effect on cable operator investment in cable networks.

IV

Is a Bias Against Vertical Integration Appropriate?

In recent years, there has been a revival of theorizing about the potentially anticompetitive effects of vertical integration. It is now well understood that when successive stages of an industry are imperfectly competitive, as is the case in cable television, vertical integration can but need not be harmful.[13] The cable television industry has been one of the most fertile testing grounds for these theories.[14]

Two main concerns about vertical integration in the cable television industry have been

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[13] See Krattenmaker, Thomas G. and Steven Salop (1986) "Anticompetitive Exclusion: Raising Rivals' Costs to Achieve Power over Price," *Yale Law Journal*, vol. 96, pp. 209-93; Salinger, Michael A. (1988) "Vertical Mergers and Market Foreclosure," *Quarterly Journal of Economics*, vol. 103, pp. 345-356; Hart, Oliver and Jean Tirole (1990) "Vertical Integration and Market Foreclosure," *Micro - Brookings Papers on Economic Activity*, pp. 205-276; Ordover, Janusz A.; Garth Saloner; and Steven C. Salop (1990) "Equilibrium Vertical Foreclosure," *American Economic Review*, vol. 80, pp. 127-142; and Salinger, Michael A. (1991) "Vertical Mergers in Multi-Product Industries and Edgeworth's Paradox of Taxation," *Journal of Industrial Economics*, vol. 40, pp. 545-56.

[14] For the most thorough treatment, see Waterman, David H. and Andrew A. Weiss (forthcoming) *Vertical Integration in Cable Television* (Cambridge: MIT Press).

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raised. The first is that vertically integrated cable operators give preference to the networks they own over the ones they do not own. The second is that cable operators that are vertically integrated into cable networks will try to exclude entrants into the distribution of multi-channel video programming by either refusing to let them carry their networks or, less drastically, by charging them a higher price.

Of these two, the effect of vertical integration on carriage is the one that has been studied more systematically.[15] Vertical integration between cable operators and pay cable services does affect carriage decisions. Time Warner owns HBO and Cinemax. Viacom owns Showtime and The Movie Channel. Both are cable operators. Compared to cable operators with no vertical ties to pay cable networks, Time Warner systems are more likely to offer Cinemax and less likely to offer The Movie Channel. Similarly, Viacom is more likely to offer The Movie Channel and less likely to offer Cinemax. All else equal, the reluctance of vertically integrated operators to carry competing networks is a cost of vertical integration. However, their increased frequency of carrying their own networks is a benefit, and the results simply do not justify a conclusion that these costs outweigh the benefits.

Cable operators with ownership interests in a particular basic cable network are more likely to carry that network than cable operators unaffiliated with the network. There is no

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[15] In addition to Waterman and Weiss (forthcoming), see Salinger, Michael A. (1988) "A Test of Successive Monopoly and Foreclosure Effects: Vertical Integration between Cable Systems and Pay Cable Services," unpublished manuscript; Salinger Michael A. (1989) "Prepared Statement," *Media Ownership: Diversity and Concentration; Hearings before the Senate Subcommittee on Communications of the Committee on Commerce Science, and Transportation* (Washington: Government Printing Office), pp. 97-108; and Klein, Benjamin (1989) "The Competitive Consequences of Vertical Integration in the Cable Industry," unpublished manuscript.

evidence, though, that cable operators with ownership ties to a network are less likely to offer any particular network that they do not own.

While there is some anecdotal evidence that competitors to incumbent cable operators have trouble getting access to programming, none of the evidence is systematic.[16] Moreover, some independent cable networks have chosen to grant exclusive distribution rights within an area to the incumbent cable monopolist. Thus, there is certainly no evidence that competing program distributors have more trouble gaining access to networks with ownership ties to cable operators than to networks without such ties.

Against this backdrop, there has been an important benefit from vertical integration in cable. Cable operators have ownership interests in most of the major cable networks. Not only do they have stakes in established networks, but they have been instrumental in starting new networks.

It is, of course, difficult to prove conclusively that networks like the Discovery Channel and Black Entertainment Television would not exist without investment by cable operators. There is, however, ample reason to suspect that this is indeed the case. Most of the costs of operating a cable network are fixed. Once a network is offered, the marginal cost of providing it to an additional system is very small. Indeed, because of the opportunity to sell advertising, cable networks would typically be willing to pay for carriage if they had to.

Of course, cable networks add value to a cable system, so cable operators would pay to carry a network if they had to. The price that ultimately emerges, therefore, is the outcome of bargaining between cable operators and cable networks. Because most cable operators are still

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[16] See Waterman and Weiss (forthcoming), chapter 5.

monopolists or near monopolists in the distribution of multi-channel programming and because many cable channels have substitutes, it is the operators who are typically in the stronger bargaining position. This is particularly the case for large cable operators who can threaten to exclude a network from a large number of systems. When cable networks are independent of cable operators, there is a risk that each cable operator will bid prices down to a level where the cable network is unprofitable.

Section II presented estimates of the cost to cable operators of their affiliation with existing cable networks. It argued that these costs might be high enough to induce them to divest themselves of those shares. Some of these networks are now so well established that they would remain viable without cable operator investment. There are two reasons, however, why it is desirable to preserve the incentives for such investment. First, the incentive for cable operators to divest themselves of their current investments in cable networks is also a disincentive to invest in new networks. Second, existing networks sometimes upgrade their service and seek increases in subscriber fees in return. For example, TNT raised its subscriber fees after it signed a contract to carry National Football League games. Established networks can expect the same sort of resistance to such price increases as new networks experience with respect to their subscriber fees. Most cable operators represent a relatively small fraction of all cable subscribers. Because programming has some features of an economic "public good,"[17] each cable operator has an incentive to be a "free rider." Each would like other cable operators

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[17] A pure public good has two features. The first is that once it is provided, the marginal cost of providing it to an additional consumer is 0. Goods with this feature are said to be "non-rivalrous." The second is that once it is provided, it is impossible to prevent those who refuse to pay for it from consuming it. This feature is known as the "non-exclusivity" condition. Cable networks are a public good only in the first sense of the term.

to agree to sufficient subscription fee increases to finance the programming improvements but not to pay the increase itself. Cable operator investment in cable networks may be necessary to overcome this free rider problem.

<div align="center">V</div>

<div align="center">**Implementation of the Proposed Rules**</div>

As was discussed in Section II, the magnitude of the cost of affiliation under the proposed rules depends critically on how much affiliation would lower a cable operator's price. This is difficult to know because there are likely to be severe problems in implementing the "lesser of cost and fair market value" standard.

To a first approximation at least, "fair market value" is the price that a network would charge if no cable operators were affiliated with it.[18] Unless the FCC wants to discourage cable operator investment in cable networks, which it apparently does not,[19] then there would be no reason not to allow a cable operator to treat the fair market value as a cost. Presumably, the rationale for the "lesser of cost and fair market value" standard is the FCC's suspicion that fair market value is difficult to calculate.

There are two possible approaches to estimating "fair market value." The first is to use

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[18] This notion of fair market value is only approximately correct because of the market imperfection that gives rise to cable operator investment in cable networks in the first place. Absent any cable operator stake in a network, all cable operators might succeed in negotiating subscription fees that are too low for the network to be profitable.

[19] *In the Matter of Implementation of Sections 11 and 13 of the Cable Television Consumer Protection and Competition Act of 1992, Horizontal and Vertical Ownership Limits,* 8 FCC Rcd 8565, Released October 22, 1993, Second Report and Order.

the price charged by the network to non-affiliates (the "prevailing price rule"). The FCC has

rejected this approach for those cases when more than 25% of a network's output goes to

affiliates. In a companion paper, I argue that it should apply under a much broader set of

circumstances.[20]

The other possible approach to estimating fair market value is to use prices charged by

comparable independent networks. As the FCC has stated, the obvious difficulty of this

approach is finding comparable networks.[21] Without an objective measure of quality, cable

operators might try to compare their affiliated networks with higher quality independent

networks that are superficially comparable.

As difficult as it might be to measure fair market value, measuring cost appropriately is

likely to be more difficult. First, basic cable networks generate two main sources of revenue:

subscription fees and advertising. There are at least three ways in which advertising might be

treated in calculating the cost of generating subscription fees. One possibility would be to ignore

advertising altogether, although it seems unlikely that the FCC would adopt such an approach.

Another possibility would be to allocate the costs between advertising and subscription fees

based on revenue shares. A third possibility would be to treat the cost of generating subscription

fees as "net costs," which would be costs minus advertising revenues. Similarly, the allocation

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[20] Specifically, I argue that a prevailing price rule should apply whenever cable operators own less than 62% of a network. In addition, in those cases when cable operators own more than 62%, a prevailing price rule should apply when the sum of cable operators' ownership shares and the fraction of sales to affiliated systems is less than 150%.

[21] *In the Matter of Implementation of Sections of the Cable Television Consumer Protection and Competition Act of 1992: Rate Regulation* and *Adoption of a Uniform Accounting System for Provision of Regulated Cable Service*, Report and Order, FCC 94-39, ¶ 269.

of costs between sales to affiliates and to non-affiliates could conceivably be done either on an average cost or net cost basis.

In addition to these issues, a fundamental issue in implementing a cost standard is to determine an appropriate allowed rate of return. Networks have physical assets such as office space and equipment to transmit their signals. In addition, some network expenditures represent investment in reputation even if they are not on physically durable assets. For example, CNN's expenditures on covering the Gulf War provided both an immediate benefit of viewership at the time and a future benefit of loyal viewers.

While these issues of allocation of costs over time are important, a more important determinant of the appropriate allowed rate of return is risk. Some cable networks are unsuccessful. If those that are successful can only recover their expenditures with perhaps some small mark-up, then the expected value of trying to launch a new network would surely be negative.

To be sure, there are some factors that would mitigate how dire the consequences of a cost-based standard would be. First, the standard concerns the price that a cable operator can pass through, not the price that the network can charge. As was discussed in section II, a price reduction of a penny imposes a cost of something less than a penny per subscriber. Second, if an average cost approach is used to determine the cost of generating subscription fees to affiliated operators, the cost standard would apply only to a fraction of a network's revenues. Third, the costs could be avoided by divesting. Still, the existence of factors that might mitigate disincentives is not a legitimate justification for creating them.

VI

Conclusion

The fundamental dilemma that the FCC faces in regulating the price of cable television service is how to restrain prices without simultaneously reducing the incentive to improve the quality of cable television service and, in particular, the quality of programming available on cable. The programming cost pass through provision in the regulation of cable prices is designed to preserve such incentives.

Absent any provision to prevent abuse, there is a risk that a cable operator will create the Time of Day Network, which consists of a camera perpetually focused on a clock, and charge itself a hefty subscription fee for carriage. It is completely appropriate for the FCC to impose regulations to prevent such practices. The FCC's proposed solution to this problem is, however, simply too heavy-handed. A prevailing price rule should be adopted under a much wider set of circumstances than those embodied in the proposed regulations. Even when that rule is not appropriate, the FCC might reconsider the "lesser of cost and fair market value" rule. For example, there might be cases in which a plausible estimate of fair market value can be obtained, in which case it should apply. Estimating cost will be a great boon to lawyers, accountants, and economic consultants, but it is a seriously flawed standard and should be avoided if at all possible.

Technical Appendix

Cost to a Cable Operator of Tighter Price Constraints

The body of this report argues that the FCC's proposed rules for affiliate transactions impose a cost of vertical integration on cable operators with ownership shares in cable networks. The nature of this cost is to reduce the price that the cable operator can charge. This appendix establishes the cost per subscriber to a cable operator for each $1.00 reduction in its allowed price.

Let P be the price charged by the cable operator for basic cable service and $Q(P)$ be the demand curve. Furthermore, assume that the cable operator's costs C are given by:

$$C = F + cQ \tag{A1}$$

where c is the marginal cost per subscriber (assumed constant) and F are fixed costs. Given these assumptions, the cable operator's profits can be written as:

$$\pi = (P - c)Q(P) - F \tag{A2}$$

To see the effect of a mandated price reduction on profits, take the derivative of (2) with respect to price:

$$\frac{d\pi}{dp} = Q + (P - c)\frac{dQ}{dP} = Q[1 + \frac{P - c}{P}\eta] \tag{A3}$$

where η is the elasticity of demand.

Setting equation (A3) to 0 and solving for P yields the profit-maximizing price of basic service (P_m) as a function of marginal cost:

$$P_m = \frac{c}{1 + \dfrac{1}{\eta_m}}$$

(A4)

Let R be the ratio of the regulated price to the monopoly price. Thus,

$$P = RP_m = \frac{Rc}{1 + \dfrac{1}{\eta_m}}$$

(A5)

Now, substituting (A5) into (A3) gives the change in profit due to an increase in the allowed price:

$$\frac{d\pi}{dP} = (1 - \eta \frac{(1 - R) + \dfrac{1}{\eta_m}}{R})Q$$

(A6)

Table 1

Change in Profit over Change in Price
(per subscriber)

(a)

$R = .83$

η_m

		-1.20	-1.50	-2.00
	1.00	0.041	0.102	0.205
η/η_m	0.75	0.281	0.327	0.404
	0.50	0.520	0.551	0.602

(b)

$R = .9$

η_m

		-1.20	-1.50	-2.00
	1.00	0.022	0.056	0.111
η/η_m	0.90	0.120	0.150	0.200
	0.80	0.218	0.244	0.289

(c)

$R = .95$

η_m

		-1.20	-1.50	-2.00
	1.00	0.011	0.026	0.053
η/η_m	0.95	0.060	0.075	0.100
	0.90	0.109	0.124	0.147

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